

Thrombosis and embolism complicating ventriculoatrial shunt for hydrocephalus: echocardiographic findings

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SUMMARY The echocardiographic findings of a right atrial thrombus and its migration to the right ventricle are presented. The thrombus occurred as a complication of an infected ventriculoatrial shunt system of the Pudenz-Heyer type for hydrocephalus.

The value of echocardiography in the diagnosis of atrial tumours and thrombi is well established (Effert and Domanig, 1959). We would like to document the echocardiographic findings of an unusual right atrial thrombosis and its embolisation in a 2-year-old child. The thrombus occurred as a complication of an infected ventriculoatrial shunt system of the Pudenz-Heyer type for hydrocephalus. It was first located in the right atrium, posterior to the tricuspid valve, then moved to the right ventricle, and finally led to embolic occlusion of the left main pulmonary artery.

Case report

In a female patient with sporadic achondroplasia abnormal head growth was observed at the age of 7 months. Cranial computer tomography, pneumoencephalography, ventriculography, and intraventricular pressure monitoring disclosed communicating, progressive hydrocephalus with considerably increased intraventricular pressure, exceeding the well-known moderate hydrocephalus in achondroplasia. Nine months after implantation of a Pudenz-Heyer type ventriculoatrial shunt, the child had several febrile episodes and was readmitted with severe *Staphylococcus aureus* septicaemia and ventriculitis.

CARDIAC FINDINGS AND COURSE

On admission a loud systolic murmur over the 3rd right intercostal space was found which was not present previously. Heart size was increased on x-ray examination, with infiltration of the right mid-lobe. Heart rate, blood pressure, and electrocardio-

gram were normal. Finally removal of the shunt, treatment of septicaemia, and digitalisation brought about some clinical improvement. One week later, however, sudden deterioration with paroxysmal ventricular premature beats (250/min) occurred. The systolic murmur changed considerably and became distinctly softer, and acute pulmonary thromboembolism was suspected. The patient died before surgery could be attempted.

ECHOCARDIOGRAPHIC FINDINGS

Echocardiograms were recorded from the fourth left intercostal space using a 5 MHz transducer and a Picker system. The first echocardiogram was recorded on admission, and showed a dense layer of finely structured echoes on the atrial side of the tricuspid valve (Fig. 1).

One week later, after the murmur had become softer, there was a significant change in the echo: in contrast to the first echo the right atrium was now absolutely free of echo, but the right ventricle into which the leaflets were opening, was filled out by dense, finely structured echoes which could also be recorded in the right ventricular outflow tract (Fig. 2).

POSTMORTEM FINDINGS

These included several small thrombi attached to the right atrium, to the chordae tendineae of the tricuspid valve, and to the right ventricle. One large thrombus completely blocked the left main pulmonary artery. Histological section showed no sign of old pulmonary thromboembolism or cellular reaction to the pulmonary thrombus.

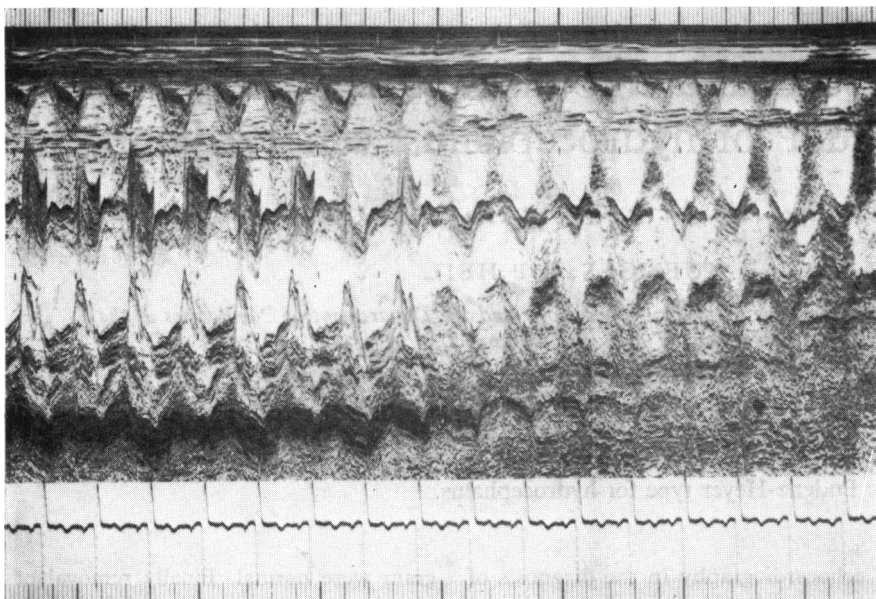


Fig. 1 *Echocardiogram on admission: the opening figure of the tricuspid valve is filled out by fine, dense echoes.*

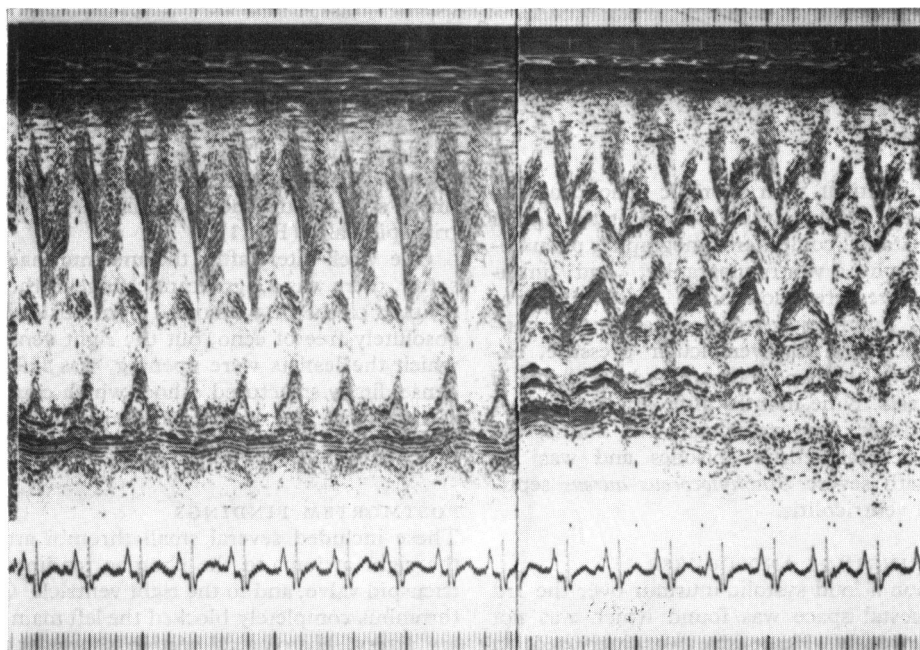


Fig. 2 *Echocardiogram one week later: the opening figure of the tricuspid valve is free of echoes which are now filling out the right ventricle (left), reaching into the outflow tract (right).*

Comment

Cardiopulmonary complications have been reported in 7 per cent of 143 patients treated with ventriculoatrial Pudenz-Heyer shunt for hydrocephalus (Anderson, 1973). Other complications included infections (29%) and blockage of the shunt (55%).

At necropsies of patients with ventriculoatrial shunts, cardiac and/or pulmonary thrombi were found in the vast majority of cases (Emery and Mahgrefte, 1969; Anderson, 1973). In many patients microembolisation is mild and intermittent, usually arising from the right atrium and so is difficult to recognise. But in some, it may lead to frank pulmonary hypertension and cor pulmonale (Keck *et al.*, 1978).

Previous shunt infections are found in most patients with thrombi (Jüngst *et al.*, 1977). Sudden death from embolisation of major thrombi is a permanent risk.

Echocardiography may be a useful means of early detection of major cardiac thrombi. In our patient we could follow the migration of the thrombus from the right atrium to the right ventricle by echocardiography. Though thrombectomy could not be performed in time in this

particular patient because of concomitant severe infection, the story serves to emphasise that echocardiography should be included in the regular assessment of such patients, particularly when cardiopulmonary complications are suspected or infections of the shunt system occur.

References

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